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Role of the stimulated radiation of Yb3+ ions in the formation of luminescence of the Y0.8Yb0.2F3:Tm3+ solid solution

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Abstract

© 2015, Pleiades Publishing, Inc. A new mechanism has been proposed for the transfer of the energy of exciting laser radiation through the donor subsystem (Yb3+) to acceptors (Tm3+), which induces multiphoton transitions in the acceptor subsystem. The coherence of the induced radiation of donors is of key importance in this mechanism. An analytical dependence of the intensity of the up-conversion luminescence of Tm3+ (1G4 → 3H6) ions in the Y0.8Yb0.2F3:Tm3+ system on the pump power at the steady-state excitation by 934-nm infrared radiation of a laser diode has been obtained using the mathematical technique of the theory of Poisson processes. In contrast to known mechanisms, this dependence approximates the experimental dependence well in a wide power range (200–1200 mW). The proposed model is applicable for any system where the energy of pump radiation is transferred to acceptors through the subsystem of donor ions.

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